Public Concerns Regarding the Proposed Crandon Mine & DNR Responses

A Summary of Public Comments and Questions
from the July 31, 1997
Public Meeting at **Rhinelander**, Wisconsin,
with DNR Responses

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Introduction

The Department of Natural Resources (DNR) wishes to thank all of the citizens who attended the July 31 public meeting at Nicolet College. As intended, the Department received many comments and questions during the meeting. Many of these questions raised issues that the DNR intends to analyze before publication of the Draft Environmental Impact Statement (DEIS).

Additional information is available in a number of recently updated mining information sheets available from the Department's Rhinelander (call Cathy Cleland at 715-365-8997) and Madison (call Shannon Fenner at 608-267-2770) offices. These are: *Potential Mining Development in Northern Wisconsin, The Cumulative Impacts of Mining Development in Northern Wisconsin, How a Mine is Permitted, Local Decisions in Mining Projects, Protecting Groundwater at Mining Sites, Reclamation and Long-term Care Requirements for Mine Sites in Wisconsin, How the Department of Natural Resources Regulates Mining, Addressing Public Concerns with Wisconsin's Laws Governing Mining,* and *Wisconsin's Net Proceeds Tax on Mining and Distribution of Funds to Municipalities*.

For a comprehensive description of how mining is regulated, refer to: *An Overview of Metallic Mineral Regulation in Wisconsin*, by Thomas J. Evans, published by the Wisconsin Geological and Natural History Survey (WGNHS) as Special Report 13, 1996 (revised edition). The document is available from the WGNHS office in Madison (phone: 608-263-7389).

The following pages contain Department of Natural Resources (DNR) responses to the questions and comments that arose at the public meeting. By reviewing the videotape of the meeting, the Department has made an effort to include each comment. In the instances that several individuals asked similar questions, an attempt was made to accurately capture the essential meaning in a single paraphrased question. Of course, with the number of comments received, it is possible that one or more questions have been accidentally overlooked. This is not the Department's intent, and any questions not answered within this document should be sent to Bill Tans at the following address: Bill Tans (SS/6), Department of Natural Resources, P.O. Box 7921, Madison, WI 53707. The questions and comments are written in bold type, and the Department responses follow each question in regular type. Where Wisconsin Statutes or Administrative Codes are paraphrased, the reader is advised to check the original language if more complete information is desired.

Wisconsin River & Proposed Discharge Issues

Biochemical Oxygen Demand (BOD), Dissolved Oxygen Levels, and the Re-Allocation Process

1.

Q: How long will the BOD reallocation process for Segment A of the Wisconsin River take? Does the reallocation involve revising NR 212? Please explain the process and need for revising NR 212.

A: Chapter NR 212, Wis. Adm. Code, specifies how BOD discharge is to be allocated among dischargers on the Wisconsin River. Monitoring on the Wisconsin River between Rhinelander and Grandfather Dam has revealed that the dissolved oxygen concentration (DO) along that stretch occasionally falls below 5 ppm. This is the level necessary to protect the health of fish and other aquatic organisms. Low DO levels indicate that we should consider changing the amount of oxygen-depleting BOD that enters the river from both point source (permitted) dischargers and non-point sources (runoff from the land surface).

If a decrease in the total amount of BOD being discharged to the river will indeed be necessary, then NR 212 will need to be revised to reflect the decrease. The process for creating and revising administrative rules is detailed in Chapter 227, Wis. Stats. Typically, Department staff invite representatives from the entire spectrum of interests in an issue to participate in drafting a rule revision. Meetings held during this process are open to the public. The rule proposal may or may not be revised based upon the testimony presented during the public comment period. The draft rules are sent to the Natural Resources Board for review and approval. If approved, the Department then submits the rule proposal to the Legislature for review.

We anticipate that the waste load allocation process for Segment A of the Wisconsin River would take approximately one and a half to two years to complete. The exact schedule would be determined by the technical issues associated with waste load allocation, including the sampling and computer modeling tasks.

2.

Q: If there are problems already with the amount of dissolvable oxygen going below the allowable number of 5 mg/L, why are we even considering adding more pollution? Won't we be far below what should be allowed? Your pie chart shows that the Wisconsin River is 97% of the time at 5 mg/L oxygen, and 3% of the time it falls below. But how often, if ever, was it above the 5% <u>minimum</u> - can the river even take the additional load of Crandon Mining Company) CMC? How much waste can the river handle over the years?

A: The level of dissolved oxygen in Segment A of the Wisconsin River has dropped below 5 mg/L on limited occasions. The pie charts that were used at the Rhinelander meeting were meant to demonstrate that the dissolved oxygen in the Wisconsin River was <u>above</u> 5 mg/L for 97% of the time. The exact reason why it falls below 5 mg/L has not yet been determined. We are currently involved in field studies to examine this very issue.

The waste load allocation process will first need to determine what the assimilative capacity (how much the river can absorb and naturally degrade without harm to the fish and wildlife) is for Segment A. Unless we can determine the cause of the low dissolved oxygen, it

will be unlikely that our assessment of the assimilative capacity would go up. A later step is to determine how that total capacity is allocated to industries, municipalities, non-point sources, margin of safety and other demands.

If the Crandon Mining Company's discharge goes to Segment A, it would either need to receive a portion of the total allocation for BOD (biochemical oxygen demand), or discharge below detectable levels for BOD. Discharging below detectable levels of BOD means that there would be almost no BOD in the discharge - it would not be zero, but not measurable either. If Crandon Mining Company (CMC) were eventually to receive an allocation, the allocation would be designed to maintain the dissolved oxygen levels at or above 5 mg/L at all times and at all points in Segment A of the Wisconsin River.

3.

Q: Why was the BOD measuring meter at Hat Rapids shut down three years ago? What was the thinking about doing this? Especially knowing that Crandon Mining was looking at possible discharge points?

A: The decision to stop servicing the dissolved oxygen meter at Hat Rapids was based solely on budgetary constraints. A number of other monitoring devices also were terminated at the same time. Budget cuts within the statewide program required some very difficult decisions be made. One of those decisions was to stop service on the dissolved oxygen monitor at Hat Rapids Dam. The decision had nothing to do with the Crandon Mine. In fact, at the time of the decision, CMC had not yet proposed sending its treated wastewater to the Wisconsin River. The monitor at Hat Rapids was put back into service in the spring of 1997.

4.

Q: It is my understanding that toxic metals loading in the discharge to the river does not necessarily affect the BOD loading. For this proposal, are you looking at toxins in the water and/or sediment and, if not, why not?

A: The concentrations of heavy metals discharged to the Wisconsin River would not affect the BOD loading, since BOD results from the decay of organic materials. We are reviewing the extent to which other toxins could adversely affect the aquatic life, wildlife, and human health. Wisconsin has water quality standards for many substances, including the metals in the proposed discharge. Water quality standards represent concentrations of substances in surface water which cannot be exceeded in order to protect aquatic life, wildlife, and human health. If, according to the application of laws pertaining to surface waters, a water quality standard has the potential to be violated by a particular substance, that substance would be limited in the discharge permit. Limits would be calculated to be protective of the environment to prevent the significant lowering of water quality and any toxic effects. We are also reviewing the extent to which sediments could be impacted. Monitoring is ongoing to establish baseline conditions in the sediment. The build-up of pollutants in sediments is a legitimate concern that the Department is analyzing. See also Response #5.

5.

Q: You have addressed one type of pollution, which is BOD. Is the Wisconsin River routinely monitored for other types of pollution that could result from the Crandon mine (such as heavy metals)?

A: The Wisconsin River is routinely monitored for other types of pollution that could result from the Crandon Mine. Historically, the Wisconsin River has been perhaps the most intensely monitored river in Wisconsin. The monitoring data enables the Department to calculate or predict whether the addition of treated mine wastewater would cause a violation of water quality standards. To make certain that site-specific, accurate information was available, the Department collected water quality samples on the Wisconsin River at Hat Rapids three times in 1996 for verifying background concentrations of a large list of substances, including heavy metals.

In response to concerns that the Crandon Mine could contribute to the deposition of metals in Wisconsin River sediment downstream, we are also monitoring existing conditions in Lake Alice and other nearby deposition areas.

6.

Q: How much dissolved oxygen is added by spillways and above ground or water discharge? Can oxygen be added to the Wisconsin River? If so, why isn't someone oxygenating the Wisconsin River?

A: Low head dams and spillways do add some oxygen to the water; however, it is normally an insignificant amount. This is largely because the water is not agitated (turbulent) for a long enough period of time to absorb much oxygen.

Oxygenating a river could be done and has been considered at some locations in the state. However, to oxygenate the river could involve a significant amount of money. There would be capital expenses to install aeration equipment, such as surface aerators or air diffusers at the bottom of the river and air compressor equipment to supply the air. Plus there would be operational and maintenance costs. Who would or should be responsible for oxygenating the river is another difficult issue. Though re-aerating or oxygenating the river is possible, it is probably not a viable option. Aeration could *treat* the symptoms of too much BOD in the river, but doesn't *solve* the problem. Only reducing the BOD will. Pollution prevention is always better than treatment of the pollutant after it is discharged.

The mine wastewater would be very low in BOD content due to the nature of the wastewater. However, in order to comply with the water quality requirement of 5 mg/L dissolved oxygen, further BOD discharged to this segment is prohibited. Consequently, the Crandon Mining Company has proposed an additional final step in its wastewater treatment to add oxygen to its effluent prior to pumping it through the pipeline. This would be done as a means to control any BOD to comply with a proposed BOD effluent limit of 'no detection' during the BOD wasteload allocation period of May through October. Adding dissolved oxygen to reduce BOD may be done chemically by addition of hydrogen peroxide (which degrades to oxygen and water) or potassium permanganate (which degrades to oxygen, potassium, and manganate), or by mechanical aeration.

7.

Q: The people who currently live near the Wisconsin river and fishermen state that humans cannot eat the fish due to contamination. Now additional waste from the Exxon pipeline will further cause problems. When can the fish be eaten safely if we can not eat them now?

A: It is true that a number of the flowages on the northern sections of the Wisconsin River have fish consumption advisories. The advisories are explained in the publication *Important Health Information for People Eating Fish from Wisconsin Waters*, Wisconsin Division of Health and Wisconsin Department of Natural Resources, Publication No. FH 824 97. (This document can be obtained by calling 608-266-2621.) The advisory in this document does not prohibit consumption of fish from the Wisconsin River. Instead, it presents information concerning the levels of mercury found in fish in some of the flowages and suggests limiting consumption, especially for pregnant women. Mercury is extremely bio-accumulative, which means that it becomes more concentrated in each step up the food chain. Hence, animals near the top of the food chain, such as certain fish or eagles, are more susceptible to mercury. Mercury is present in the fish of many surface waters primarily due to high concentrations in historical discharges and to atmospheric deposition. It is more bio-accumulative in some waters than in others due to water chemistry differences. Wisconsin's current water quality standards account for the bioaccumulation potential of mercury. Since wildlife that eat fish are the most sensitive to bioaccumulation of mercury, the most stringent water quality standard for mercury is that for the protection of wildlife. This standard, 1.3 ng/L (parts per trillion), is applicable to the proposed discharge from the Crandon Mine.

Wastewater Treatment & Discharge

8.

Q: A May 1997 DNR publication reads: "For this reason our interpretation of the 1986 Federal law is that it does not apply to the proposed mine." [Referring to the interbasin transfer of water] Who made that decision? The DNR says that only groundwater would be diverted from the mine site into another watershed. Doesn't the DNR understand the connection between groundwater and surface waters?

A: The interpretation of the law was made by Department legal staff. The Army Corps of Engineers subsequently issued an identical decision. Although the Water Resources Development Act of 1986 pertains only to surface water, we recognize that ground and surface waters are indeed interconnected. However, the history of water regulation has been to address different kinds of waters differently. For instance, the Great Lakes are regulated differently from inland lakes in this state. The dominant law in this country affecting water quality is the Clean Water Act, but that act applies to surface waters only, not to groundwater. These are just a few of the many instances in which legislative bodies have determined that the public interest is best served by acknowledging differences between types of waters.

Wisconsin's statute which regulates inter-basin transfers of water, s. 281.35, Wis. Stats.(previously numbered 144.026), does not distinguish between surface and groundwater. However, the Wisconsin Legislature specifically stated that no such transfer, be it of surface water or of groundwater, requires a permit from the state unless the transfer exceeds 2 million gallons per day. Based on our preliminary figures, the Crandon Mine transfer would be well

under the legislatively established amount for which a permit is required.

9.

Q: The Environmental Protection Agency (EPA) has written that in their opinion, the Water Resources Development Act applies to groundwater. How will this affect the project?

A: The EPA's project manager for the Crandon Mine has stated his opinion as identified in the question. However, his opinion does not necessarily reflect an official opinion of EPA's Region V or the agency as a whole, and it was not a legal opinion. The U.S. Army Corps of Engineers, which has direct permitting authority for wetland dredging and filling at the proposed project site, and which has primary responsibility for administration of the Water Resources Development Act, has provided its legal opinion that the act does not apply to the proposed groundwater withdrawal. This is consistent with both current practice in Wisconsin and the Department's legal opinion.

10.

Q: Is all the waste going to the Wisconsin River? Why is the DNR letting the company discharge at Hat Rapids Dam rather than in the Wolf River, which is closer? Publicity has mentioned the Wolf River. You did not.

A: All of the treated mine inflow wastewater would go to the Wisconsin River, with the exception of any treated wastewater used for mitigation purposes. However, mining solid wastes, such as tailings and waste rock, would be managed at the site.

The DNR can't specify to any discharger where it must discharge, but instead must analyze whether the location selected by the permit applicant is acceptable based on state statutes and administrative codes, and if the proposed level of treatment would meet the effluent requirements. The level of required wastewater treatment is dependent upon the use classification of the receiving water. The Wolf River is an Outstanding Resource Water (the highest water quality classification); any discharges to it must be of higher quality than a discharge to the Wisconsin River, which is a lower use classification (a warm water sport fish water).

If CMC proposed a discharge to the Wolf River system, it would require a very expensive and sophisticated treatment system. Such a system would be costly to operate, consume a lot of energy, require complex monitoring, and be less reliable than the more conventional treatment systems. Based on those criteria, and following an analysis of alternative discharge methods and sites, the company chose the Wisconsin River as its proposed discharge location. The Department must now analyze this proposed discharge to see if it would comply with all relevant laws and regulations.

There has indeed been a great amount of publicity given to concerns over the proposed mine's potential impacts to the Wolf River. Since all treated mine wastewater would be discharged to the Wisconsin River, these concerns involve the potential for groundwater to carry heavy metal contaminants, from both the closed mine and the tailings stored in the Tailings Management Area (TMA), into the Wolf River via its tributaries. Once the Department's work on groundwater flow and contaminant transport is complete, the Department will have the means to predict the impacts to the Wolf River watershed. If any violations of Wolf River water quality standards are predicted, then the project could not be permitted.

11.

Q: What care will be taken to see if the 38 mile pipeline does not leak or cause toxic effects? Who finds the leaks in the pipeline that's underground? Who checks the toxic effect of toxic problems? Who stops the use of the pipeline when leaks occur?

A: The pipeline would contain treated wastewater that must comply with permit effluent limits. The water would meet all drinking water standards except for sulfate (the drinking water standard is 250 mg/L and CMC's pilot wastewater treatment study showed 900 mg/L) and selenium (the drinking water standard is 50 µg/L and CMC's pilot wastewater treatment study showed 110 µg/L). The permit wouldn't allow the discharge of toxic substances at toxic concentrations. Any leakage from the pipeline would likely not be environmentally significant because the effluent meets water quality standards of most receiving waters.

The pipeline design will be reviewed by the Department to determine the acceptability of the proposal. Flow in the pressurized pipeline would be monitored at three locations: the pump station located at the mine site, the booster pump station located at about the half-way point, and the point of discharge at Hat Rapids Dam on the Wisconsin River. Any discrepancy in flow could indicate a leak in the pipeline which must be investigated and repaired by the Crandon Mining Company.

12.

Q: NR 115 prohibits waste pipelines from crossing shoreland-wetland areas. With 7 streams and rivers to cross, how can this be legally done?

A: Pipelines for gas, water supplies and wastewater commonly cross shoreland and wetlands. The proposed Crandon Mine pipeline would be bored beneath all major streams and rivers along its route (see map, Appendix B), and thus would cross some wetlands as well. Chapter NR 115, which is the state's administrative code overseeing protection of shoreland and wetlands, allows for utilities to cross these areas without amendment of the controlling ordinances. NR 115 also makes provisions for private pipelines to cross shoreland-wetland areas, but it becomes more complicated. A privately owned pipeline across shoreland-wetland areas requires rezoning out of the shoreland-wetland district by the county. Rezoning the pipeline corridor is only permissible under NR 115 if the construction of the pipeline through the wetland will not result in a significant adverse impact on the wetland values listed in NR 115. As with all other pipeline projects, the costs associated with construction and post-construction reclamation is borne by the project sponsor, in this instance, the Crandon Mining Company.

13.

Q: The 38-mile pipeline proposal will impact Oneida County and the Town of Crescent at Hat Rapids. Why aren't Oneida County and the Town of Crescent included in

the "parties" element of the decision making process? Forest County, and the Forest County Towns of Nashville and Lincoln are included. Why the exclusion of Oneida County and the Oneida County Town of Crescent from the local agreement process?

A: This question addresses several different elements of the approval process for mining operations. If the question relates to participation by the County or Town in the trial-like Master Hearing process, there is no bar to their participation. Anyone willing to take on the responsibilities as 'parties,' will be allowed to so participate. These responsibilities include being subject to orders from the Hearing Examiner regarding: making their witnesses available for deposition, answering interrogatories, and participation in exchange of documents.

The Master Hearing, or final decision-making process, is entirely different from the local agreement process. By state law (s. 293.41, Wis. Stats.), only government entities containing any portion of the mining site in their boundaries or those which have zoning or land use control over a part of the project have the right to enter into a local agreement with the mining company. A mining company must satisfy local zoning requirements before the mining permit can be issued, and a local agreement is one way to accomplish this goal. Because a portion of the mining site (the wastewater pipeline) would be constructed within the Town of Crescent and Oneida County, both municipalities are eligible to negotiate local agreements with the mining company. The Department does not have a role in the administration of this statute - that is between mining companies and local municipalities.

14.

Q: Has the Department of Transportation given the okay to allow a pipeline along the state highways?

A: No, the Department of Transportation (DOT) has not given final approval for the wastewater pipeline to be constructed along the state highways. The Crandon Mining Company has contacted the DOT for permission, and it appears that construction of the wastewater pipeline would be consistent with DOT policy. DOT could not provide final approval until after the environmental impact statement has been completed.

15.

Q: When I retired from active participation in Wastewater Management, the US EPA was pushing 'zero' pollution. You have been talking "Dilution is the Solution". Is there a conflict here?

A: There is no such thing as life with "zero pollution". All life in the ecosystem is part of a natural cycle that includes waste products or "pollutants" which are then assimilated back into the environment and reused. If the questioner means "zero discharge", this has been a goal for toxic bio-accumulating substances, especially in the Great Lakes. The 21 worst bio-accumulating substances were the initial focus of the Great Lakes Initiative. These consist of organic compounds, pesticides, and mercury; water quality standards have been developed for all of these substances. Because these substances accumulate in fish, aquatic life, wildlife, and humans, the bio-accumulating substances in the environment must be minimized. New or increased discharges of bio-accumulators to waters of the Great Lakes may not exceed the most stringent applicable water quality criteria. For other substances, including toxics, dilution is still an environmentally acceptable solution. Dilution can be a factor in the calculation of water quality based effluent limits for toxic substances, if the water quality criteria (numerical standard at which the in-stream concentration of a substance would cause toxic affects) is greater than the background concentration of the substance. None of the toxic substances has a zero criteria. For some toxic substances, however, the criteria may be so low that it is less than the analytical test method level of detection. In those cases, an undetected substance would be reported as zero.

16.

Q: Bench scale tests have shown that Exxon's mine wastewater would contain 144 pounds per day of BODs. Is this correct? What type of wastewater treatment system will Exxon have to deploy in order to remove all BODs? Does the current Ladysmith mine remove all BODs before discharging wastewater to the Flambeau River?

A: Initial calculations were that 144 pounds of BOD per day was the maximum estimated amount of BOD that would be discharged. This amount is based on the maximum flow of 1200 gallons per minute and a BOD concentration of 10 mg/L. However, due to the current dissolved oxygen problem and remodelling process on the Wisconsin River, this amount would not be permitted. (See Responses #1 & #2.) To address a potential BOD limit of no detectable concentration during the wasteload allocation period of May through October, the Crandon Mining Company has proposed the use of either chemical treatment with hydrogen peroxide or mechanical aeration of the wastewater effluent prior to discharging, to remove the BOD and increase the dissolved oxygen. BOD hasn't been an issue at the Flambeau Mine in Ladysmith because the Flambeau River doesn't have a BOD wasteload allocation. And like the proposed Crandon Mine, the wastewater contains very little organic material so it isn't a pollutant of concern. The Flambeau Mine permit doesn't even require monitoring for BOD.

17.

Q: Describe the chemical process whereby cyanide from process water will be removed by the wastewater treatment plant if necessary.

A: Process wastewater containing cyanide would not normally be treated by the wastewater treatment system. Instead, the process water is proposed to be in a closed cycle where it would enter the tailings pond with the tailings, flow into the reclaim pond, and be sent back to the mill for reuse. Once in the TMA, the cyanide would initially exist as hydrogen cyanide (HCN) and cyanide ions (CN^-) because of the high pH of the process water (pH 10-11).

Some of the HCN present may evaporate into the air, but most would remain in solution. The remaining HCN would dissociate to hydrogen ions (H^+) and CN^- or be transformed to ammonia (NH^3) and carbon dioxide (CO_2), thiocyanate (SCN^-), or metallocyanides (MeCN), depending on whether or not the process takes place in the presence of oxygen. Either way, SCN^- or MeCN are both much less toxic than HCN. MeCN or SCN^- would remain in the TMA or move out in the leachate or exfiltrate.

Periodically, however, some water from the reclaim pond would have to be treated for discharge. Cyanide in the form of sodium cyanide, used in the mill mineral concentration process, is a very toxic substance. However, the oxygen in air degrades it into carbon dioxide and ammonia gases. The wastewater treatment process should introduce enough air to the wastewater to promote this degradation.

Cyanide is expected to be present in the TMA in very low concentrations. The concentrations should be below acute toxicity for any realistic oral ingestion of the pond water and for dermal contact. Cyanide is not likely to be a significant concern at the TMA, either long-term or short-term. The wastewater permit would contain cyanide monitoring and a limit to assure cyanide wouldn't be discharged at toxic concentrations.

18.

Q: It is my understanding that the Crandon Mining Company will collect from their shafts in the neighborhood of one million gallons of water daily, pollute it, and then dump it in the Wisconsin River. It is also my understanding that other mining companies are poised to come into the region and will likely be faced with disposal of groundwater coming into their shafts or pits. This would of course compound the problem.

A: The wastewater that would be discharged to the Wisconsin River would not be "polluted." The primary source of the water would be groundwater draining into the mine and coming into contact with air and the mine workings. It would be sent from the mine to the wastewater treatment system, where the mine wastewater would be treated so that it meets the same water quality standards that all municipal and industrial wastewater systems must meet. Only then could it be discharged to the Wisconsin River. The treated wastewater would meet drinking water standards for all but two criteria: sulfate (the drinking water standard is 250 mg/L and CMC's pilot wastewater treatment study showed 900 mg/L) and selenium (the drinking water standard is 50 µg/L and CMC's pilot wastewater treatment study showed 110 µg/L). The water that is used in the processing of the ore, on the other hand, would be recycled on-site in a closed loop system and typically not discharged. (See Response #20.)

There have been occasional newspaper reports of large numbers of ore bodies across the state and mining companies waiting to begin permitting them. However, there are only two known potentially economic ore bodies in Wisconsin, besides the Crandon ore body, that have not yet been developed. These are the "Bend" project in Taylor County, and Noranda's "Lynne"

project in Oneida County. No permitting activity is expected at the Bend project because of the low grade reserves. In September, Noranda gave up its lease on the Lynne ore body. There is also some ongoing mineral exploration across the state. Any mining company wishing to extract a mineral deposit would have to meet the same wastewater discharge and water quality standards as all other municipalities and industries in the state. (For more detailed information on this topic, request the mining information sheets "Potential Mining Development in Northern Wisconsin" and "The Cumulative Impacts of Mining Development in Northern Wisconsin" listed in the introduction to this document.)

19.

Q: Does the wasteload allocation study take into consideration thermal impacts of the mine outfall?

A: The treated wastewater would be traveling inside the pipeline for nearly 2 1/2 days, at depths of up to 6 feet underground. Therefore, its temperature at the time of release into the Wisconsin River would likely be very close to that of groundwater - roughly 55 ° F. This would not thermally impact the river any more than a natural discharge from groundwater.

20.

Q: Please describe any and all ways mill process water could be discharged into the Wisconsin River?

A: Mill process water would never be discharged without first being treated by the wastewater treatment process, and under normal operating conditions, process water would not be discharged at all. The mill process water and tailings ponds would operate as a closed system which would usually require the continuous addition of makeup water. However, the process water may be routed to the wastewater treatment system if there is precipitation that exceeds the holding capacity of the tailings ponds, or if there is a buildup of chemicals in the process water that requires replacement with new makeup water. Discharge of process wastewater under these two conditions in allowed under s. NR 270.104(2)(b), Wis. Adm. Code. For the effluent to be discharged, it still must always meet permit effluent limitations. Treated process wastewater may also be reused at the mill. When the mill closes, the remaining process wastewater and tailings pond water would be treated and discharged when the mill closes.

21.

Q: Will the Crandon mine discharge contain hazardous material?

A: The wastewater discharge may not contain toxic materials at concentrations that could adversely affect fish, aquatic life, wildlife, or humans. Hazardous materials used at the mine would include sodium cyanide, sodium dichromate, copper sulfate, sodium hydroxide, and sulfuric acid. The wastewater treatment system, designed to remove metals contaminating the mine drainage water (the primary component of the discharge), would prevent the lowering of water quality in the Wisconsin River. Required monitoring of effluent quality prior to discharging would assure compliance with permit effluent limits.

22.

Q: Will monitoring for phosphorus in the proposed wastewater discharge be proposed based on the use of the reagent, trade name, Aerophine? Chemical data sheets describe this reagent as sodium diisobutyldithiophosphinate.

A: The wastewater discharge permit would require the monitoring for total phosphorus and a 1.0 mg/L monthly average limit will be proposed. Low concentrations of phosphorus would be anticipated, based on a result of 0.026 mg/L from the pilot treatability study. Sodium Diisobutyldithiophosphinate is a frother reagent used in the ore concentration process at an estimated rate of two tons per month. Any phosphorus from this reagent would be detected in the total phosphorus test. Because the process water would normally be recycled in the mill, this reagent would not often be present in the discharge.

23.

Q: How much selenium is Exxon planning to dump in Wisconsin River? Is it 110 micrograms per liter? According to the National Wildlife Refuge System, waterfowl have reproductive problems when the selenium level is only 8 micrograms per liter. Is it true the Wisconsin River currently has no selenium?

A: The Department's split sample taken from the pilot treatability test on simulated mine wastewater, and analyzed by the State Lab of Hygiene, had a selenium result of 110 micrograms per liter (μg/L). Selenium wasn't detected in the Wisconsin River at a level of detection of 0.3 μg/L, based on three samples taken at Hat Rapids Dam in 1996. The following selenium concentration limits in the proposed wastewater discharge permit were calculated for three effluent flow rates, as requested by the Crandon Mining Company to reflect the possible operating conditions:

Flow Rate	Daily Maximum	Weekly Average
100 gpm	4,600 μg/L	2,400 μg/L
600 gpm	770 μg/L	400 μg/L
1,200 gpm	390 μg/L	200 μg/L

For selenium the acute water quality criterion is 19.48 μg/L, the chronic criterion is 5.0 μg/L, and human health is 2600 μg/L (because human health concentration is high, it isn't used as a limit - the fish and aquatic life toxicity criteria is much more stringent). These criteria reflect what in-stream concentration would cause adverse affects on fish and aquatic life. The effluent limits are greater than the criteria because of the significant dilution provided by the Wisconsin River, plus the benefit provided by discharging into the turbine intakes at Hat Rapids Dam that would rapidly mix the wastewater with the river in a "zone of initial dilution". The limit is also calculated to be conservative so it is only 1/3 of the remaining assimilative capacity of the stream (this equals the criterion minus the background). This method of calculation of effluent limitations is the Department's standard practice for all dischargers in the state and is codified in Chap. NR 106, Wis. Adm. Code.

Based on the pilot test, the effluent would be in compliance with all the permit limits. Note that as the effluent flow rate increases the concentration limit decreases. Also contained in the permit are daily maximum and weekly average mass limits of 2.5 Kg/day and 1.3 Kg/day respectively, which don't vary with the flow.

There is no wildlife criterion in Chap. 105, Wis. Adm. Code for selenium; however, since the chronic fish and aquatic life criterion of 5 μg/L is less than the cited wildlife number, our calculated limit is more stringent and would be even more protective of wildlife.

24.

Q: How is <u>new</u> research and its results on water habitat and species incorporated into these standards? For example, let's say the selenium research proves damage at a certain level, and your accepted level is higher, how do you incorporate new knowledge into the standards? What's the process and how long does it take?

A: When new information/data is generated which adds to a database, or increases the accuracy of a water quality standard, the Department may proceed to update the water quality standard. If the study which resulted in the new data is determined acceptable (i.e. the study was done in a quality manner), a revised (or new) water quality standard would be generated by Department staff, at which point a formal administrative rule revision process begins. A rule revision includes seeking approval of the Natural Resources Board to conduct public hearings, conducting public hearings, making any warranted changes to the rule (the new water quality standard or its implementation), going back to the Natural Resources Board for adoption of the administrative rule, and obtaining legislative review of the new standard. Unless it's an emergency rule, and depending upon the level of controversy, input, etc., the entire process takes approximately one year.

Mercury

25.

Q: I understand that Exxon is already 20 times over the mercury standard in their pilot study. What can be done to prevent Exxon from acquiring a variance to dump mercury into the Wisconsin River? Given that Lake Alice and Lake Mohawksin are already contaminated with mercury to the point that fish advisories are posted, can the DNR guarantee that they will not consider allowing Exxon any variances with regard to relaxing the effluent standard of 2.0 nanograms/liter? If not, what standard would the DNR use instead of the 2.0 level?

A: The Department's split sample taken from the pilot treatability test on simulated mine wastewater, and analyzed by the State Lab of Hygiene, had a mercury result of 40 ng/L. The old mercury criteria was 2 ng/L (recently decreased to 1.3 ng/L), so the result does *appear* to be 20 times above the limit. However, this conclusion would be incorrect. The level of detection used for the pilot treatability test was 30 ng/L and level of quantitation was 80 ng/L. Using levels of detection and quantitation that high produces notoriously unreliable results if the sample tested has a very low mercury concentration, below this range. Because the result is between the level of detection and level of quantitation, the actual mercury concentration isn't known with certainty. All that can be concluded is that mercury is present. A similar situation occurred with the Flambeau Mine, where the State lab of Hygiene tested Flambeau's effluent and had a mercury result of 30 ng/L. When follow-up ultra low-level tests were done, mercury was found at only 0.33 and 0.35 ng/L, at a level of detection of 0.048 ng/L and level of quantitation of 0.16 ng/L (estimated).

One reason for the different results between testing methods is that mercury is very

difficult to measure because of the likelihood of sample contamination from atmospheric mercury. Therefore, low-level tests, using very "clean" techniques, provide a more reliable answer than the EPA approved method more commonly used. (EPA is currently reviewing a draft describing a "clean" technique, Method 1631, for potential approval.) We can be confident in the results of the low-level tests because a method having an ultra-low detection level (for example, less than one) would be able to reliably pick up true concentrations in any amount over one. The ultra low-level tests have been used many times in Wisconsin, both on surface waters and on discharges, and the consistency of the data show that it is a reliable method.

The proposed Crandon Mine wastewater treatment system would use the same treatment processes as those used by the Flambeau Mine. We would expect similar compliance with the mercury limit at the proposed Crandon Mine. A variance to limitations on mercury hasn't been requested by the Crandon Mining Company. The proposed wastewater discharge permit contains a 1.3 ng/L monthly average limit for mercury, and requires the use of the ultra low-level mercury test with a level of detection of 1 ng/L or less. However, the Crandon Mining Company has the right to request a variance from a water quality based effluent limit, if it believes it has sufficient evidence to show a standard is not feasible. A request for a variance would be reviewed under s. 283.15, Wis. Stats. (formerly numbered 147.05, Wis. Stats). We must allow due process and consider a request for a variance. To guarantee we wouldn't consider a variance would violate the Crandon Mining Company's right to equal protection under the law. We can't predict what a potential alternative limit could be. But based on what's known from the ultra low-level mercury testing on the Flambeau Mine wastewater discharge, the proposed Crandon Mine would meet the limit, so a variance wouldn't be needed.

26.

Q: Will the treatment process to remove metals, which consists of lime-sulfide precipitation followed by filtration through sand filters, also remove mercury to the extent that it meets the 2.0 nanograms/liter standard? If not, are there any methods that can reliably remove mercury from mine waste at the rate of 1000 gallons per minute?

A: See Response #25. The influent wastewater from the mine drainage may contain mercury at around 1000 ng/L (parts per trillion). This wastewater would then be treated at the wastewater treatment plant on site. One indication of the concentration of the Crandon Mine treated wastewater is the process at the Flambeau Mine, which has treatment processes nearly identical to those proposed at the Crandon Mine and also similar influent mercury levels. This effluent had two ultra low-level mercury tests done with results of 0.33 ng/L and 0.35 ng/L. Based on this evidence and professional judgement, the lime and sulfide treatment process could remove mercury below the 1.3 ng/L limit contained in the administrative code.

27.

Q: Why won't you hire our foremost mercury expert, Carl Watras, to do the necessary research to estimate the long term impact of Exxon's mercury discharge into the Wisconsin River and the synergistic effects with Exxon's sulfate discharge? Won't the sulfate discharge facilitate the conversion of mercury into toxic methyl-mercury?

A: The environmental behavior of mercury is extremely complicated. The Department is fortunate to have some of the best scientists in the nation, whose research has largely occurred in northern Wisconsin. Carl Watras, a DNR employee, is certainly one of those experts. The two scientists doing much of the mercury work, Jim Hurley of the DNR and Dave

Krabbenhoft of the U.S. Geological Survey, are world recognized experts on mercury. In addition, the Department has hired Steve Gherini of Tetra Tech, who is an expert at mercury modeling and has also worked extensively in northern Wisconsin, as a consultant. The Department feels that this group of people has the expertise necessary to study the potential impact of mercury and sulfate from the Crandon Mine; however, we have not ruled out asking Mr. Watras to assist on the Crandon Project review.

We have performed a preliminary analysis of the issue of whether the discharge of sulfate to the Wisconsin River could have a significant impact on mercury levels. This is one of the least well understood mercury issues. However, at critical conditions (high effluent flow and low river flow), it is possible that unregulated discharged sulfate to the Wisconsin River could have an impact on the formation of methyl mercury (the very toxic bio-accumulative form of mercury). Therefore, although Wisconsin has no water quality based toxicity criteria for sulfate, the Department will propose that the wastewater permit contain a sulfate concentration limit based on best professional judgement. The Department's goal is to ensure that sulfate increases in the Wisconsin River would be minimal, to prevent any measurable adverse effects. Sulfate by itself isn't toxic, but its possible secondary effects (there is some evidence that it may increase mercury methylation and also impact wild rice production) make it an environmental concern.

28.

Q: The U.S. EPA has said that the reason the upper branch of the Wisconsin River was left off the 303 (d) Impaired waterbodies list is that the DNR did not have sufficient confidence in the accuracy of the data for mercury to justify listing it on the 1996 TMDL list. Given the history of the river and the fact that every stretch of the river down to at least Prairie du Sac made the list, this is hard to swallow. Has the Department managed to accurately sample the river yet and what are those results?

A: The 303(d) list and the TMDL (total maximum daily load) list are often referred to interchangeably because listing on the federal 303(d) list requires creation of TMDLs. Contrary to the statement in the question, no other stretch of the Wisconsin River was included on the 303(d) list. The upper stretch of the Wisconsin River has been included on an "interim final" list for 303(d) because of concerns with the dissolved oxygen level. The difference between the interim final list and the final list is slight - there is uncertainty about the water quality in water bodies on the interim final list because of limited data. However, both lists have equal priority. Part of the current effort in BOD allocation remodeling is to improve that knowledge base for Segment A of the Wisconsin River.

With respect to mercury, because of the widespread prevalence of the element in the environment and the separate special attention being paid to it in the state and nationally, the Department did not include mercury in our consideration for 303(d) listing at this time. Nonetheless, the permitting process for the Crandon Mine will address the discharge of mercury.

The Department has collected river samples at Hat Rapids Dam for the analysis of mercury. The samples were analyzed using the best, ultra low-level measurement techniques. The results, from the three samples, were: 2.2, 5.6, 4.78 ng/L (parts per trillion). The geometric mean of these results is 3.89 ng/L, which is the concentration typically discussed as being the background concentration of mercury in the Wisconsin River at the Hat Rapids Dam.

The Tailings Management Area

29.

Q: About the TMA - What are the long term hazards? Are the contents poisonous? What is the alternative to the tailings pit - i.e., non-sulfide mining?

A: The TMA would be an engineered land disposal facility designed to permanently contain the tailings in an environment devoid of oxygen and water movement. The TMA design is intended to prevent all long term hazards by encapsulating the tailings and, to the extent possible, duplicating the zero oxygen and zero water movement conditions that existed for millions of years in the pre-mined ore deposit (the ore deposit is located much deeper than the underground aquifer).

The CMC tailings would consist of ground up rock - of concern are primarily iron sulfide (pyrite or fools gold) and other elements that make up the earth's crust. Many of these constituents are essential to life, but most are toxic if consumed in excessive amounts. Workers would not be required to wear special protective gear or to take other special precautions when working with these tailings. However, common sense precautions, such as hand washing prior to eating, would be needed to limit incidental ingestion of the tailings. During the filling of the TMA containment cells, precautions would be needed to keep the tailings wet or otherwise prevent the tailings from leaving the facility as wind born dust. Once the containment cells have been capped off, dust transport of tailings should not be a problem.

The most significant potential pathway for the environmental release of metals, sulfates and other dissolved constituents at this site is via the groundwater. This could occur if the TMA cap is insufficient to prevent the inflow of water and oxygen into the waste mass. Oxygen in the air or dissolved in the water would react with the sulfide minerals, thus producing acid. If the acid is not neutralized by limestone or other buffering minerals in the waste, it would cause some metals to be dissolved in the water. A continuing influx of water would flush those dissolved metals downward to the groundwater. The transport of these contaminants via the groundwater could eventually result in nearby water supply well or surface water contamination. The TMA is designed to limit the development of acid conditions and the transport of dissolved metals by limiting air and water from the interior of the facility.

Most metal deposits, and some nonmetal deposits such as coal, contain, or are associated with, sulfide minerals in sufficient quantities to produce acid drainage if sufficient quantities of buffering minerals are not available in the deposit and if the mine and mine wastes are not properly managed. Non-sulfide mining is therefore not an alternative if, on a world wide basis, the resources necessary to supply demand are to be produced. Alternatives for the use or processing of tailings will be discussed in the Environmental Impact Statement (EIS).

30.

Q: Having property near the tailings pit is very much of a concern in regard to the groundwater and future illness it could cause - cancer, etc.

A: See Response #29. Our mining and mine waste disposal laws are designed to prevent hazards to human health, welfare and the environment. Facility designs that do not provide for conformance with these regulations and standards cannot and will not be permitted by the Department. If, for some unforeseen reason, the design should fail and groundwater contamination results, it would take many years for the contamination to move off site. This would allow ample time for detection and corrective response.

31.

Q: What possible justification is there for a 1200 foot compliance boundary around mine waste sites and mined out deposits in this state? Doesn't this allow a massive area where standards can be exceeded?

A: The Department has not yet established the compliance boundary for the proposed Crandon Project. The compliance boundary and the groundwater standards will be proposed after completion of the groundwater modeling analysis. The question is most likely referring to the recently proposed revisions to the mining rules which would impose the requirements of the state groundwater rule, ch. NR 140, Wis. Adm. Code, on mining operations. The distance to the design management zone, or compliance boundary, currently applicable and proposed to be maintained for mining facilities (1,200 feet) is much larger than that allowed for other types of facilities.

The greater distance proposed for mining facilities is a reflection of their substantially different approval criteria. Specifically, to gain a permit, mining permit applicants must demonstrate (using detailed and conservative groundwater modeling and site specific data and evaluation) that the proposed operation will meet all applicable groundwater quality standards. Such demonstration is not required for any other type of facilities.

The greater distance does not mean that the groundwater resource is less protected at mining sites, however. Mining facilities may not cause detrimental impacts to water supplies and groundwater beyond the property owned by the facility; may only cause limited impacts, as defined by numerical groundwater standards, within the compliance boundary on property owned by the facility; and may not cause impacts to surface water bodies which result in violation of surface water standards and criteria. These principles are the same for mining facilities as for other regulated facilities in the state and serve to assure that groundwater is adequately protected around such facilities, so that other users of groundwater are not adversely affected. Furthermore, the regulations strongly discourage contamination even within the 1,200 foot area - levels of contamination above the natural background within the 1,200 feet would result in an evaluation of whether remedial action is necessary.

32.

Q: If wastewater sludges which may contain nitrates (a source of oxygen) are disposed of in the TMA (as planned), could there be biological or chemical oxidation of the sulfide waste and acid generation?

A: The wastewater treatment plant sludge could contain some nitrogen, primarily from the residues from blasting in the mine. We expect that any nitrogen that would be present in the sludge would be in small quantities and that the chemical state of that nitrogen would likely be mostly reduced (present as ammonia or ammonium, NH_3 or NH_4^+) due to the nature of the wastewater treatment process. (Pore water from the sludge from the pilot treatment contained about 1.0 mg/l of total kjeldahl nitrogen [reduced nitrogen - either ammonia or organic] and about 0.22 mg/l nitrate [NO_3^-].) In addition, the volume of wastewater treatment solids discharged to the tailings facility is estimated to be less than 2% of the total flow to the facility. (Solids from the small sanitary wastewater treatment facility would not be discharged to the tailings facility. Instead, it is proposed to be hauled off site to a licensed disposal facility.)

Any nitrate that would be present in the sludge would be expected to be chemically reduced via one of two pathways in the tailings facility - denitrification or nitrate reduction. Both the denitrification and nitrate reduction reactions use free hydrogen ions (H^+) to produce

either nitrogen gas (N_2) or ammonium and water. In general, the electron acceptor (the material being oxidized) that is most favored for the microorganisms that reduce nitrate is organic matter and not sulfide.

It is important to recognize that the tailings would be potentially reactive to many oxidizing chemicals, with likely the most important being oxygen (O_2) and ferric iron (Fe^{3+}). In general, we do not expect nitrate to be a significant factor in the oxidation of the tailings.

33.

Q: The DNR has stated that the mill process water will be alkaline and therefore, each cell in the TMA will supposedly not develop acidic conditions that could harm the delicate liner system. What experiments or detailed operating results from a similar TMA can the DNR point to that would warrant such an optimistic forecast?

A: Many plastic products are highly resistant to damage by acid conditions. This is why acid shipping containers and tank liners are commonly constructed of plastic materials. (For example, if you've ever purchased muriatic acid at a hardware store, you'll notice it is sold in a plastic container.) The TMA membrane liner material would be selected based on its proven ability to resist degradation from any chemical condition that may potentially exist within the facility.

In the environment, sulfuric acid (H_2SO_4), tends to dissociate completely in water. The hydrogen ions (H^+) produced react with any available dissolved minerals containing hydroxyl ions (OH^-) to yield water. Upon completion of these reactions, if the free hydrogen ions and free hydroxyl ions are in balance, the solution will be neutral. If there continues to be an excess of free hydrogen ions, the solution will remain acidic and if there is an excess of free hydroxyl ions, the solution would be alkaline.

Over time, should the tailings facility not function according to design, acidity could be produced by the reaction of the sulfide minerals with oxygen in the presence of water. Were this to occur, it would be more likely to happen well after facility closure.

Initial neutralization of any acid produced would be by the carbonate minerals in the process water, those naturally present in the tailings, and those proposed to be added during the end of operations in each tailings cell. These carbonate minerals (calcite and dolomite) would buffer the solution at a pH between about 6 and 8 until those minerals are completely reacted. Any continued production of acid would then drop the pH to between about 4 and 5, where the solution is buffered by dissolution of iron and aluminum hydroxide compounds. Following dissolution of the hydroxides, the solution may then be buffered at a pH between about 2 and 4 by aluminosilicate minerals (micas, feldspars, quartz).

Following facility closure and reclamation, the final cover system is designed to exclude oxygen and water and thus prevent the formation of acid rock drainage. This is because once the tailings have been covered and drained, it is only by the addition of water and oxygen that acid drainage would be produced. The final cover and the waste mass would be monitored to ensure that the cover system is adequately limiting the movement of oxygen and water into the waste mass. Should problems develop, the final cover could be repaired or replaced as needed.

34.

Q: Exxon has stated a "worst case" scenario of 150 years for the lifespan of their liner system. How long into the future must a particular liner technology work in order for it to be considered successful at preventing pollution? How can a site like the TMA be managed in perpetuity when technology such as liners and leachate collection systems can only realistically be rated to last a limited period of time?

A: The TMA is designed to be a constructable facility that will not allow groundwater quality limits to be exceeded. The liner of the TMA cells is just one element of that design.

CMC selected a period of 150 years as the service life of the geomembrane in the liner in order to be able to conservatively simulate the potential impacts of a liner failure. There is no evidence that the geomembrane will, in fact, degrade after 150 years of service. Researchers into geomembrane properties are developing predictions that polyethylene geomembranes will have service lives of several centuries. In addition, the leakage rate at the base of the cells will be controlled by the soil components of the liner as well as the geomembrane.

The liner and leachate collection system are part of the overall design of the TMA. The liner and leachate collection system are most effective during the time periods where a TMA cell is being filled and the tailings are consolidating and draining. This covers the years from construction of the cell through a few years after the final cover is placed - about a decade. The final cover system is the important element in the long term, since it is responsible for preventing water from infiltrating into the top of the tailings mass. If no water enters the capped facility, no water will drain out. Therefore, it is inspection and maintenance of the final cover system that will be key to limiting any effect that the TMA cells might have on groundwater. The final cover system is more accessible than the liner and leachate collection system, and inspection and repairs can be made without disturbing or excavating the tailings mass.

35.

Q: If the mine shuts down for economic reasons, the sides of the TMA could take several years to decades to completely fill. What's to stop the liner from subsiding on the steep sides of the tailings cells during the years that it takes to fill the cells?

A: We would not expect the compacted soil in perimeter berms to have any significant settlement, since they would be made of the on-site soils, which are very compact. In addition, the liner and leachate collection system have to be able to be strong enough to resist the pull of gravity and the weight of the overlying cover of till soils. We have experience with landfills with 3:1 side slopes and composite liners and 4:1 final slopes and composite covers; these facilities have not had stability problems. We agree that it is desirable that the interior side slopes of the TMA cells not be left open for longer than necessary, but a few years of exposure should not be a problem.

36.

Q: Why would a thick layer of compacted clay be more affected by freezing and thawing than a mere 1/4 inch thick geosynthetic clay liner? Has this TMA design ever been tested at 40-50 degrees below zero?

A: A GCL (geosynthetic clay liner) is a layer of swelling clay (bentonite) held in

place between layers of strong plastic fabric. The clay soils typically used for liners in Wisconsin and the commercially available GCLs can be affected by freeze-thaw episodes, particularly if there are several cycles of freezing and thawing during the same cold weather season. Most of the damage appears to occur during the spring thaw period.

There has been some research over the past 10 years into freezing effects on both compacted clay and bentonite, by itself or incorporated into GCLs. Natural clay soils tend to develop cracks and lenses, to about a two foot depth, that tend not to seal back up after thawing or after loading up with a cover of waste. The bentonite in GCLs has been shown to be much better at sealing up cracks that form. The geotextiles in GCLs help to prevent cracks from opening up as much as they might in unconfined bentonite. With both materials, covering with soil definitely helps insulate the clay soils or bentonite from freezing and reduces the magnitude or number of freeze-thaw events that might cause cracking.

It is not certain how much cracking develops due to freeze thaw events in operating landfills, since the clay or GCL are protected by covering layers of geomembranes, drain layers, etc. To be safe, solid waste regulations require that a liner in a solid waste landfill not be left without a protective cover of waste for longer than one winter season. Where a site design allows a side slope to potentially be exposed for a few or several winter seasons, it is prudent to use a soil component of a composite liner that has been shown to have greater resistance to freeze-thaw effects.

37.

Q: What happens if the tailings ponds begin to pollute beyond the mine?

A: If this project is permitted, it would have an extensive environmental monitoring program that would require detailed groundwater and surface water monitoring on and around the facility. In addition to groundwater and surface water monitoring, the mine and tailings facility would be monitored closely to make sure they are performing as designed and predicted. This monitoring should quickly detect any significant discharges of contaminants. At that point, a clean-up program would be initiated. Depending on the type of release, clean up could involve repair of the tailings facility, installation of cutoff walls, pumping of groundwater for treatment or to control movement, installation of reactive walls (material which would intercept the contaminant and change its chemistry, so that the substance is no longer a threat to groundwater quality), or many other techniques.

Sulfate is one of the pollutants of concern in the tailings ponds. Sulfate would be present in the TMA leachate and could leak into the groundwater. Unlike heavy metals, sulfate is soluble in water (like salt and sugar), and would move with the groundwater as it moves toward Hemlock Creek, Swamp Creek and Pickerel Creek and other water bodies. The travel times to these water bodies would be tens to hundreds of years. We expect sulfate and some other pollutants to travel beyond the TMA and mine and ultimately reach these surface water bodies.

The purpose of our groundwater flow and contaminant transport modeling is to determine what the concentrations of those substances could be in the groundwater, and what they could become by the time they reach surface water. It is likely that these substances would be substantially diluted or chemically altered by their passage through the ground. However, if our analyses indicate that these pollutant concentrations would likely exceed the groundwater or surface water standards *anywhere* or *anytime* beyond the compliance boundary or design management zone, we could not approve the project. We have not yet completed the analyses necessary to make these determinations.

38.

Q: The tailings ponds are shown placed on Forest County Crop land. Who owns this land?

A: At this time, it is owned by the County. Subject to Department approval, Forest County will transfer ownership of approximately 1,000 acres of county forest land for CMC's TMA and buffer area in exchange for 1,396 acres of replacement land owned by CMC.

39.

Q: The leachate collection system under the TMA is a key component in making sure that the contaminated waters don't reach the aquifer. What happens when the leachate collection pipes clog after 20-50 years? Will the DNR demand that the leachate collection system is designed so that it can be maintained if it clogs or is damaged by subsidence?

A: CMC has been informed that the waste characterization work they are performing will have to demonstrate the likelihood of clogging in the drain layer. The leachate collection system has been designed to allow cleaning of the collection pipes. We intend to require that pipe cleaning be done on a regular schedule. Further, the specifications for the pipe and the collection system are designed to support the weight of the tailings and final cover system. We do not expect subsidence to be a problem, since the soils that the TMA is built in are already very heavily compressed by glacial action and will not be subject to significant subsidence.

Regardless, the leachate collection system does not necessarily have to be functional for more than a few decades after closure of a cell. Once a cell is closed and the original ponded water is drained, the facility cover (not the liner) would be the key to ensuring that an acid drainage problem does not develop. If there is little water percolating into the facility, there would be little water draining out of the bottom of the facility. The cover would also limit oxygen access to the tailings. Without both, acid drainage cannot develop. Since the cover is near the surface and relatively accessible, it could be repaired or replaced as necessary. The time of concern for the leachate collection system is the time period of active cell operation, the post-filling consolidation period, and the first few years after placement of the final cover system.

40.

Q: Is there another tailings pond system like the Crandon mine proposal in use elsewhere? Has this liner ever been used before? Is this a similar design to the one used at Summitville in Colorado? Do you think it will work well?

A: To our knowledge, no other mine tailings disposal facility has as elaborate a design as that proposed for the Crandon Mine. The Department expects that a waste containment design proposed for any mining project will be tailored to the needs of that project, using accepted engineering practices and materials. The tailings facility design proposed for the Crandon Mine is based on specific regulatory requirements in Wisconsin, site-specific conditions, and project-specific needs. If we had received a design exactly like a project in Utah or Indonesia or somewhere else, it likely would have been inappropriate for this project and would not have been approvable. The requirements here in Wisconsin have compelled the Crandon Mining Company to propose one of the most protective tailings facility designs ever developed. They have included features and materials that have been used in the past in other waste management facilities with great success. Despite this, since we are not yet finished with our analyses, it is not clear whether the proposed design will meet the State's requirements.

It is too early for the Department to determine whether or not the proposed liner system would work well. What we can say is that the TMA design includes all of the elements that lined-containment disposal sites are supposed to include, and it incorporates all of the major engineering and design changes aimed at minimizing groundwater impacts discussed with Department staff. The use of geosynthetic materials such as GCLs, geomembranes, and geotextiles is very common in waste management facilities for all sorts of solid wastes. The use of GCLs in conjunction with geomembranes for liners and covers of landfills has increased considerably in the past several years.

Like many other industrial technologies in current use, the proposed TMA individual liner components have been tested for durability using accepted simulation methods. In addition, the individual components have each been used successfully in other waste disposal systems, although the overall combination of components in the TMA design is one that has not been used before. The processed till layer and the bentonite in the GCL are natural materials that have already existed for thousands of years, so their properties would not be expected to change significantly in this application. The polyethylene geomembrane and polypropylene or polyesther geotextiles have expected survival lives of several centuries or more under buried conditions.

Bentonite clay, the primary component of the proposed GCL, has a very low natural permeability and has been used for containment facilities for decades. For instance, bentonite blended with natural soils has been used in Wisconsin and other states for sewage and water retention lagoons. The use of bentonite clay in the form of GCLs is a more recent development, propelled largely by manufacturing innovations and recent changes to federal law dealing with municipal solid waste landfills. Regulatory acceptance of GCLs has similarly become widespread, due to the results of research on their properties when used as liners.

The liner design for the leach pad at the Summitville mine in southwestern Colorado, a heap leach mine that did not use mineral processing procedures similar to those proposed at Crandon, was similar to the liner proposed at Crandon in that it used a geomembrane as a barrier. However, Summitville lacked the compacted clay components that are in the proposed Crandon TMA design. The Summitville tailings facility was constructed in mountainous area. It was also improperly installed, with much of the installation done during severe winter weather. Due to the improper installation, the surface under the liner was unstable, leading to

the development of a washout under the liner. This necessitated cutting through the liner to attempt to stabilize the base, resulting in leakage. However, much of the water pollution at Summitville has been the result of a long history of unregulated mining.

41.

Q: Will trees be allowed to grow on top of tailings ponds?

A: It is likely that some tree growth would occur on the tailings facility after it is capped, primarily from seeds from the surrounding woods. Smaller trees and other plant growth would not be a problem in the upper layers because their roots would help to extract water from the drainage and rooting zone soils. Larger trees might have to be cut when they reach a size where they might be subject to windthrow. While we have not yet completed our review of the proposed reclamation cap, we do not expect that plant roots, even tap roots, will penetrate the geomembrane. Taproots usually seek the path of least resistance to grow - it has been found by foresters and others that taproots reaching a natural hardpan surface will turn sideways to grow along the surface of the barrier.

42.

Q: What happens if the liner rips?

A: Rips, tears, and other imperfections in the geomembrane component of the liner system can be repaired by the same welding methods used to install the liner. These are heat welding methods, using fusion and extrusion welding techniques. The trick is to find the rips and other imperfections. Those that occur during construction can usually be found by visual inspection and by various types of pressure and electrical testing methods.

After the geomembrane has been covered by a drain layer, whether in the liner or final cover, it can be subjected to some additional electrical leak detection methods to find defects that might have been caused by the soil placement operation.

The Concentration of Minerals

43.

Q: Mineral concentration will take place on site. What substances are used in the concentration process for the various metals?

A: The concentration process proposed for this facility involves the use of selective flotation of the valuable minerals. The process was reportedly invented many years ago when it was noted that during the laundering of miners clothing, certain metallic minerals would adhere to the soap suds while the nonmetallic minerals would settle to the bottom of the wash tub. Finely ground ore is pumped as a slurry into series of flotation tanks. Air and reagents are added to create a froth and additional reagents are added to selectively promote the flotation of the desired mineral and depress the flotation of the other minerals. The desired minerals adhere to the froth and are skimmed from the surface. As the slurry proceeds through the circuit, the reagents are adjusted to produce zinc, copper and lead concentrates. The remaining material, called tailings, is used as backfill in the mine or is transported hydraulically to the TMA. A summary of the reagents used in this process is included in the following table.

Table 1. Chemical Reagents Proposed for On-site Use

CHEMICAL	**CAS #**	**PHYSICAL STATE**	**PRIMARY USE**
Concentrator Chemicals			
Calcium Oxide (lime)	1305-78-8	solid pellets	pH modifier
Sulfur Dioxide	7446-09-5	gas	depressant
Zinc Sulfate	7733-02-0	solid	depressant
Sodium Cyanide	143-33-9	solid	depressant
Sodium Carboxymethyl-cellulose (starch)	9004-32-4	solid	depressant
Sodium Dichromate	10588-01-9	liquid	depressant
Sodium Silicate	1344-09-8	liquid	depressant
Copper Sulfate	7758-98-7	solid	activator
Activated Carbon	7440-44-0	solid	absorbent
Xanthate Salts	140-93-2	solid	collectors
Sodium Diisobutyldithio-phosphinate	13360-78-6	liquid	frother
Thionocarbamate (1%-3% isopropanol)	067-63-0	liquid	frother
Methyl Isobutyl Carbinol (MIBC)	108-11-2	liquid	frother
Polypropylene Glycol Methyl Ether (Dowfroth 250)	37286-64-9	liquid	frother
Percol 155 (acrylate/acrylamide polymer)	25085-02-3	solid	flocculant
Wastewater/Water Treatment Chemicals			
Sulfuric Acid	80014-95-7	liquid	pH modifier/ion exchange regenerant
Sodium Sulfide	1313-82-2	solid	metals precipitation
Hydrated Lime	1305-62-0	solid	pH modifier
Sodium Hydroxide	1310-73-2	liquid	pH modifier

Coagulant polymer	(type not chosen)	--	flocculant

The Review Process, Decision, & Role of the DNR

44.

Q: I am confused about who will actually make a permit decision for the DNR. Will it be George Meyer or an administrative judge from the Department of Administration? How does the Secretary decide the identity of the decision maker? What factors are involved? Why are there options in any case? Why the possibility of more than one decision maker? Can you tell us what happens if someone challenges this decision? Can the Secretary overrule decision administratively?

A: State law (Chapter 227, Wisconsin Statutes) explaining administrative procedures provides for alternative ways that permit decisions can be made in all state agency contested case hearings, which this will be. The permitting decision (and decision on adequacy of the environmental impact statement) will be made **either** by the administrative law judge that presides over the Master Hearing or the Secretary of the DNR under Chapter 227 of the Statutes. The Secretary of the DNR will decide how the decision will be made, but that decision has not yet been made. The Department of Administration, Division of Hearings and Appeals, selects the administrative law judge to conduct the Master Hearing. There are only three law judges that conduct natural resource hearings. Other law judges handle a variety of other administrative hearings for the state.

If the final decisions on the permits and approvals will be made by the administrative law judge presiding at the Master Hearing, as it was in the Flambeau Mine case, the decision could be appealed by any party adversely affected by the decision to the Secretary of the DNR. In that case, the Secretary, in theory, could change the decision following an appeal process. However, the more likely course of action would be an appeal to the circuit court and subsequent appeals of that decision, if desired, to the appellate court and, ultimately, the supreme court.

45.

Q: The DNR will complete its EIS in late 1999. When will Federal agencies (Army Corps of Engineers & EPA) have their final EIS completed? If later, will DNR hold off any decisions or actions until the Feds have their EIS on record?

A: The U.S. Army Corps of Engineers' schedule does not affect the Department's schedule; the two processes are entirely independent of one another. The U.S. Army Corps of Engineers has developed its estimated schedule for completing its environmental impact statement and permit decision by the end of 1998. While the Department's EIS will likely be completed before that of the Corps, our decision on the project will probably be about one year later due to our lengthy Master Hearing process. The EPA has no permitting authority over this project, except to approve a spill prevention control plan before operations could begin. Therefore, the EPA will not be publishing an environmental impact statement.

46.

Q: What are some examples of situations where consultants are required to help the DNR during this EIS construction and review? Who chooses the consultants? Are more opinions sought? What are the firm names and corporate headquarters of the consultants to the DNR?

A: Department staff have expertise in subject areas such as forestry, wetlands, fisheries, groundwater, surface waters, air quality, waste disposal, mining reclamation and endangered species. However, in reviewing an underground mining proposal, there are needed areas of expertise that we do not have on staff. In addition, we sometimes hire consultants to conduct field or laboratory analyses for us or for help in preparing our environmental impact statements. We select our consultants based on their experience, discussions with professionals in the field of review, our knowledge of who can produce the required work, and other criteria appropriate to the situation.

We also will be hiring additional consultants for the Science Advisory Council created by Executive Order 309. Council members will advise the Department on technology that will reduce or minimize environmental impacts and advise the Department on whether the proposed technology would meet environmental standards.

All consultants' fees are billed to the Crandon Mining Company. Regardless of their affiliation, many of these consultants were hired as independent contractors. We have hired the following consultants in our review of the proposed project:

Groundwater modeling (flow model and solute transport):

U.S. Geological Survey - including Jim Krohelski, Dr. Randy Hunt, Chuck Dunning, Daniel Feinstein, and Dr. Dave Krabbenhoft
Wisconsin Geological & Natural History Survey - Dr. Ken Bradbury, Bill Batten, Dr. John Attig
Dr. David Blowes, University of Waterloo, Ontario

Tailings, waste disposal and waste characterization review:

Kim Lapakko, Minnesota Department of Natural Resources
Dr. David Blowes, University of Waterloo, Ontario
Dr. Craig Benson, UW Madison
Dr. Andres Trevino, Shanahan Valley Associates, Madison, WI
Steve Gherini, Tetra Tech, San Francisco, CA

Rock Mechanics:

Dr. Steve Crouch, University of Minnesota

Water quality analyses:

State Lab of Hygiene

Subsurface Investigations, well installation at Little Sand Lake:

Boart-Longyear, Schofield, WI.

Socioeconomics:

Dr. Bill Freudenberg and Dr. Steve Deller, UW Madison

Assisting in environmental impact statement preparation:

Shannon Fenner, Danielle Wood

We have not provided the consultants' phone numbers or addresses because all contacts regarding the Crandon project review should be made through the Department staff.

47.

Q: Have any of you any scientific objections to the mine? You all seem to be finding excuses for the mine to go ahead. It seems like the DNR is defending CMC.

A: Staff working on the review of the proposed Crandon Mine work on separate parts of the environmental analysis or permit review (for example, the mine de-watering approval, the mine permit, wetlands analysis, mine site reclamation, surface water discharge, and groundwater quality review). There are state laws and administrative rules in place that guide our reviews, and we use professional judgement and experience in conducting these reviews.

Yes, we have had objections to aspects of the proposal. During our review of the mining proposal, staff have identified many areas where, for example, the proposed engineering design, facility placement or construction and operations of the proposed facilities would not meet our standards or which should be changed to minimize environmental impacts. We also have identified many additional field studies that needed completion before we could finish our review. If the mining applicant can design its project to meet all of the environmental requirements and other standards in our rules, we must issue the necessary permits and approvals.

As we frequently mention in our public meetings, Department staff will explain and actively defend our role and activities in reviewing the proposed mine, but we do not defend the mining proposal or the mining company. What you may be interpreting as defending the mine are really analyses of the facts based on the laws and rules governing the review of the proposal. Our job is neither to prohibit nor promote mining. The mining review process established by the Legislature is what we must follow. We are required by law to continue review of a mining applicant's proposal until the process is completed following the Master Hearing. That process is comprehensive and thorough, and will result in a reasoned decision based upon the criteria in the law.

Wetlands

48.

Q: What justification is there to drain the wetlands? I thought they were protected? Why can't anyone fill in a wetland?

A: Wetlands are indeed protected under a wide range of situations. Wetlands regulation in Wisconsin occurs through several administrative codes, which specify which

wetland impacts are allowed and under what circumstances. Substantial authority for wetlands regulation also resides with the federal government under Section 404 of the Clean Water Act. For most projects that would impact wetlands, the U.S. Army Corps of Engineers has permitting authority. The state has significant influence over federal wetland decisions through what is called state water quality certification. That is, before a federal permit can be granted, the state must certify that the project meets state water quality standards.

Anyone cannot fill in a wetland because the people of Wisconsin have provided for protection of wetlands in recognition of the vital role wetlands play in protecting water quality, reducing flooding, providing wildlife and fish habitat, and beautifying the landscape. Nonetheless, the draining of wetlands is justified in certain circumstances. For example, projects can be permitted if the project proponent can show that there is not a practicable alternative that avoids wetland impacts and that the project would not result in significant adverse impacts to wetland functional values. Projects that meet these legally established standards may be permitted.

The laws protecting wetlands are different for metallic mining projects. In the current mining laws, the Wisconsin Legislature has acknowledged that due to the immovable nature of ore bodies, there is a much narrower range of alternatives available for siting mine facilities. Mining laws require only that mine developers minimize to the extent feasible the destruction of or damage to wetlands. In the case of the proposed Crandon mine, CMC selected a TMA site that would result in less wetland damage than more than 30 other potential sites. Also, at the suggestion of the Department, CMC modified the design and orientation of the TMA in order to keep wetland impacts to a minimum.

In conclusion, to meet wetland protection requirements, the proposed mine project will need to meet the requirements of NR 132 at the state level, and Section 404 of the Clean Water Act at the federal level.

49.

Q: Why is the mining industry exempted from NR 103? Would the DNR support eliminating this exemption?

A: The administrative rules on mining and mining waste disposal were completed in 1982 following revision of the metallic mining laws. The mining law provided that wetland impacts from mining projects were to be minimized, but mining projects would not necessarily be prohibited from being developed solely by the presence of wetlands. Thus, the Legislature determined that some wetland disturbance was acceptable because ore bodies cannot be moved, and must be mined where they are located. At the time of adoption of the mining law, the new regulations covering wetland disturbance for mining operations were more stringent than those applied to any other kind of project. In fact, the absence of meaningful wetlands protection in the state precipitated the adoption of NR 103 in 1991. However, at the time that creation of NR 103 was being considered, the Department recognized the pre-existing legislative statement applicable to mining operations. The Department determined that for NR 103 to apply to mining operations, the Legislature should amend the existing statutes to remove the wetland protection language it had adopted which is specific to mining projects.

It is the Legislature's role, not the Department's, to decide policy issues such as wetland protection at mining sites. That decision has been made by the Legislature. The Department is not in a position to support or oppose current law, but only to administer it. A few years ago, legislation was introduced that would have prohibited metallic mineral mining if there would be any wetland destruction. The Department would have applied this had it been enacted by the

Legislature, though it would been more restrictive than what appears in NR 103.

The "Mining Moratorium" Bill

50.

Q: How will the moratorium presently in the State Senate affect the DNR findings? Does the DNR know of any mines that would be able to meet the criteria in the bill, i.e. mines that have operated and been closed for ten years without violating environmental standards? A few months ago, Sec. Meyer stated that he thought that the proposed moratorium was a little harsh (quoted in the Journal/Sentinel). How can a DNR team not be unbiased when their boss has already made such a biased statement?

A: The Department's evaluations of the proposed mining project are not affected by the mining moratorium bill. SB3 (the "Mining Moratorium Bill") which passed the Senate last spring, is now in the Assembly Environment Committee awaiting action. In order to become law, it must be passed by majority vote out of the Environment Committee, passed by the Assembly, and signed by the Governor. If it passes these steps without further amendments, the legislation as currently worded would impose certain new conditions on sulfide mining in the state. Specifically, a sulfide mine could not open unless another mine had operated for ten years without breaking any environmental laws, *and* a mine had been closed for ten years without violating any environmental laws.

Although the Department has not done a thorough search of all the mines that might meet these criteria, we believe that it is likely that CMC could locate examples of mines which would comply. This belief is based on the multitude of mining operations both historically and currently in existence, and the loose wording of the criteria. Therefore, as currently worded in the Senate version, the bill would not likely constitute a moratorium on mining. Please see Appendix A for a non-partisan Wisconsin Legislative Council analysis of this issue.

Both houses must agree on the exact language of the bill before it is sent on to the Governor. Sometimes this involves appointing a conference committee, made up of representatives from each house, to reach a compromise. Because the bill could be significantly changed during this process, it is currently impossible to predict its effect on the Crandon mining project. Up-to-date information on the bill's status can be found by calling the Legislative Hotline at 1-800-362-9472. Just as with all other legislation, if the bill is passed by both houses, the Governor has the power to veto it. However, a 2/3 majority in both the Senate and the Assembly can override a gubernatorial veto.

Secretary Meyer has clearly stated that the Department does not support a mining moratorium. Rather, projects should be judged based on whether they can comply with Wisconsin's environmental laws and regulations. As in all projects, the DNR Secretary has directed that this project be reviewed in a thorough and impartial manner, with no bias for or against the project. In addition, the Department has hired knowledgeable, independent consultants to review the information provided by CMC and its consultants.

Employees working on the Crandon Mine Project have been advised that they will be questioned at the Master Hearing under oath about how they arrived at their conclusions and whether they have been directed to act contrary to their professional judgements. Wisconsin has a long history of open government, good civil service protection for its employees, a solid "whistle blowers" law, and strong employee unions. The Department is fully aware of public concerns regarding political influence in this process. We want everyone in this State to

understand that our review has been, and through the end of this process will always be, based solely on the best science possible. There will be no other influences allowed to affect the permit review and development of the EIS.

Plants, Wildlife, & Endangered Species

51.

Q: Have wild rice populations in and around Lake Alice been identified and surveyed?

A: Yes. Department staff have monitored rice beds in Lake Alice for many years and will continue to do so. Regarding the proposed project's effects on wild rice, our effluent limits would control the potential pollutants in the discharge, limiting sulfates and other pollutants of concern that would be discharged to the Wisconsin River. The levels of heavy metals in the discharge and in the river water would be far less than those known to be toxic to wild rice. Therefore, the limits should protect wild rice in Lake Alice.

Even with monitoring, there will always be some difficulty in attributing changes in wild rice to a particular discharge. These difficulties arise due to the many factors that can affect the growth of wild rice, such as water levels, wave action, or natural predation. In addition, the Crandon Mine, for example, would only be one of three permitted dischargers to the Wisconsin River above Lake Alice.

52.

Q: Have any threatened or endangered species been identified in the Wisconsin River downstream from the pipeline discharge? If so, what are they?

A: One species of dragonfly, the pygmy snaketail (*Ophiogomphus howei* - recently moved up to State Threatened status from State Endangered status), was found downstream from the proposed discharge site. Additional species of dragonflies and damselflies from this area include the following Special Concern species: splendid clubtail (*Gomphurus lineatifrons*), skillet clubtail (*G. ventricosus*), rapids clubtail (*Gomphus quadricolor*), green-faced clubtail (*G. viridifrons*), cyrano darner (*Nasiaeschna pentacantha*), Kennedy's emerald (*Somatachlora kennedyi*), and delicate emerald (*S. franklini*). The pygmy snaketail and the Stygian shadowfly (*Neurocordulia yamaskanensis*) have both been collected in the Wisconsin River downstream of Tomahawk.

Wood turtles (*Clemmys insculpta*, State Threatened) have been recorded from a number of locations along the Wisconsin River both upstream and downstream of the effluent discharge site. One rare fish, the greater redhorse (*Moxostoma valenciennesi*, State Threatened) was netted below the Hat Rapids Dam. One Special Concern mussel, creek heelsplitter (*Lasmigona compressa*) was also recorded downstream from the Hat Rapids Dam.

Surveys for rare plants occurring along and in the Wisconsin River did not locate any Endangered, Threatened, or Special Concern species.

53.

Q: Are there any ongoing studies pertaining to wildlife - especially endangered species that may be affected?

A: The Crandon Mining Company contracted with specialists from around the state and country to conduct a number of surveys for wildlife, particularly rare species, occurring in the project's impact area. Inventories for rare plants, fish, aquatic and terrestrial macroinvertebrates, amphibians, reptiles, birds, mammals were conducted in 1995 and 1996. The Department oversaw the development of the survey protocols as well as the field work and is confident that adequate information on the flora and fauna of the project's impact area is available.

At the end of September, 1997, a group of hunters told DNR biologists that they had just seen three wolves south of Lake Lucerne. A DNR biologist will attempt to confirm whether wolves have established a territory in that area. The Department will use the results of these surveys, in addition to inventory work conducted by Department staff, to assess the impacts of the mine if it is permitted and will describe the anticipated impacts in the EIS.

Socio-economics

54.

Q: If this mine goes through what will the financial impact be on Crandon - taxes and etc. Would our property taxes on the lakes be reduced? How many local people will be employed by the mine?

A: The following estimates are from the Crandon Mining Company and are contained in its Environmental Impact Report. The Department, with the help of its consultants, is in the process of analyzing these predictions and may have different predictions from the company. CMC projects that a maximum of 750 people will be hired during the construction (first three years) phase, of which approximately 20%, or 150 people, will be locals. It further predicts that between 400 and 525 people will be hired for the operations phase, of which 70%, or roughly 325 people will be locals. The Department's predictions will be issued in the Draft Environmental Impact Statement, which will likely be published early next year.

There would be many financial impacts on the Crandon area from the mine. First, the property valuation of the mine would increase the tax base for the Towns of Lincoln and Nashville, the Crandon School District, and Forest County. The total taxable value would be at its highest during the first year of operation, at approximately $110,200,000, and would decrease thereafter due to depreciation and depletion of the minerals. This total value would be taxable by the Crandon School District and Forest County, while the Towns of Lincoln and Nashville would be able to tax portions of this value based upon the physical location of taxable value. The City of Crandon does not contain any of the taxable value of the ore body and therefore would not gain assessed value. However, the local agreement between the city and CMC would result in monetary payments to Crandon. Whether or not these increased tax bases and income would result in lower property taxes depends on the revenue and spending choices made at the local level.

Other mining projects

55.

Q: What is the real track record of similar mining projects in similar land terrains - numerous lakes and rivers.

A: Judging the track record of mining operations conducted in other states or countries can be a complicated matter. One has to consider the regulatory framework in effect in that particular jurisdiction at the time the mining operation was conducted. What may have been an acceptable practice at one time may not be permissible under the existing regulatory framework or may be undesirable given the current state of knowledge. In addition, the impacts associated with a given project are largely dictated by the environmental setting in which the mining operation is located and the specific project design features. All of this combines to make it nearly impossible to compare one operation to another and judge whether similar environmental impacts would occur.

Certainly, there are numerous examples of failed mining projects and the resultant contamination of adjacent soil, surface water, and groundwater. Understanding why these sites failed can be useful for planning purposes, but the fact that problems occurred does not guarantee the same result for future operations. There are also sites which have been operated and reclaimed without causing significant environmental problems. There is much to learn from those successful operations, but as with the sites that failed, similar results are not guaranteed if the same approach is taken at another location.

Experience at other sites, whether favorable or not, cannot substitute for rigorous evaluation of specific proposed mining projects. The best approach to the problem of mining waste disposal will vary from site to site, depending on the nature of the project and the environmental characteristics of the mining site. A thorough review of any proposed project is essential to determine the most appropriate technology to ensure environmental protection. Any proposed control technologies must also be completely reviewed to ensure that the methods are scientifically valid and that the proposed design has a reasonable scientific probability of functioning as intended. This review may well show that a given project may not be capable of complying with the applicable regulatory requirements, and in those cases, the necessary approvals would not be issued.

56.

Q: You are saying you can trust CMC when in Canada they are not responsible for the clean up? Why not here?

A: Under Wisconsin law, owners of mining sites are responsible for reclaiming the entire mining site in accordance with an approved Reclamation Plan. The plan details the steps which will be taken to return the mining site to a beneficial final land use and assure the long term environmental stability of the site. In addition, the owner is perpetually responsible for the long term care and maintenance of any mining waste facility located on the mining site. To ensure that the owner performs the necessary reclamation and long term care activities various forms of financial guarantees are required, including a reclamation bond and owner proof of financial responsibility for long term care. Should an owner default on their obligations, the state would complete the necessary work using the related financial surety.

The Department is also in the process of adopting a revision to the administrative codes which would require the permittee to pay into a perpetual irrevocable trust fund. In the event of

unforeseen environmental problems at the mining site, the trust fund would be used to finance remedial actions.

57.

Q: How many other deposits could be custom milled at the Exxon site? How could an enlarged waste site or prolonged discharge be allowed as a result of custom milling?

A: Under the current proposal, custom milling of ore from other deposits would not be allowed. If Crandon Mining Company wished to mill ore from other project sites, at a minimum, the mining permit and waste disposal approvals would need to be modified. The scope of the modification process would depend on the significance of the requested change and could result in preparation of a separate environmental impact statement in the case of a substantial change. If custom milling were to be proposed, extensive information concerning the chemical, physical and mineralogical characteristics of the ore and resultant waste materials would be required, in the same manner as is required for the original permit review. Similarly, any necessary design modifications to the waste facility would also be subject to an extensive review. The final determination regarding the acceptability of the proposal would be based on whether the project, as modified, would continue to comply with all applicable laws and rules. It may also be necessary for Crandon Mining Company to seek separate approval of such a proposal from the various local units of government, depending on the details of the local agreements.

Air Pollution

58.

Q: How much energy is consumed to smelt 1 ton of copper or zinc ore? How much air pollution, using typical consumption rates, will be emitted to smelt the ore in the Mole Lake deposit? Especially with regard to mercury. The 1986 FEIS reports that 141 million kilowatt hours of electricity will be used in mine construction and 176 million kilowatt-hours per year thereafter. Given that Wisconsin produces 80% of its electricity from fossil fuels, how much air pollution, especially mercury will be emitted into the atmosphere in order to produce that quantity of electricity?

A: The ore would not be smelted at the project site or anywhere else in the state because Wisconsin has no smelters and none are proposed. Existing smelters elsewhere will continue to operate at the level necessary to supply the world demand for metals regardless as to whether this mine is permitted or not. Therefore, the Department will not be analyzing impacts of smelting the ore in other jurisdictions. Presumably those facilities have been reviewed and permitted by the responsible governmental body.

The energy usage figures quoted are not applicable to the current Crandon Mining Project. Energy usage at the proposed Crandon project is projected to be 20.5 megawatts (MW) at peak demand. Wisconsin Public Service Corporation (WPS), would be the utility supplying CMC's electricity. The WPS service area covers most of northeastern Wisconsin. If the mine began operating today, this electricity usage would represent roughly 1.5% of WPS energy production. According to the Public Service Commission (PSC), this amount of energy would

be available from the existing power grid. Therefore, the construction of additional, dedicated power generation facilities would not be required.

Also according to the PC, generating electricity to serve the Crandon project would emit roughly six pounds of mercury per year, or the equivalent of the mercury that would be released to power 18,000 homes. A significant majority of these emissions would enter the pool of atmospheric mercury. A substantial fraction of this mercury would enter the continental and global circulation patterns and would not be deposited in Wisconsin. Some increased local and regional deposition of mercury would occur, but estimating the relative proportions would be highly speculative.

Groundwater Drawdown

59.

Q: It was only recently that we experienced such a drought that is well remembered by all of the inhabitants of this region. Week after week, month after month, year after year, there was inadequate rainfall. Lake levels dropped. Piers were out of water. Thousands of birches died and the water department of the City of Rhinelander was starting to become concerned. At that time we did not have mining companies extracting large amounts of groundwater. Have you calculated what could happen during the next drought given the presence of several mining companies extracting and dumping groundwater?

A: Drought can certainly impact water levels and stream flows. The impacts of pumping groundwater from the proposed Crandon mine have to be calculated and monitored, regardless of whether or not drought conditions exist. Mine pumping could add to drought-related surface water impacts. Therefore, the Department will calculate and describe the combined impacts of an extended drought and mine pumping in the draft EIS. If it is found that mine de-watering would cause or add to any significant loss of public rights such as navigation, fishing, swimming, and aesthetic enjoyment, the mining company would be required to mitigate these impacts by replacing water lost due to the mine pumping. The mining company could not be held responsible for any impacts to surface waters solely attributable to drought conditions.

The groundwater that would be used by the Crandon mine is from an aquifer that is not connected to aquifers used to supply surrounding municipalities. The drawdown from the Crandon mine would not affect municipal water supplies even during drought conditions. Currently, there are two known potentially economic ore bodies in Wisconsin, besides the Crandon ore body, that have not yet been developed. (See Response #18.) These mines are not in close enough proximity to cause concurrent and additive impacts to groundwater and surface water. Even if there were more than one groundwater-extracting mine in the state at some future time, the public rights stages of lakes and streams would have to be protected in the same manner against impacts of mine-induced groundwater drawdown.

60.

Q: How will the water level in the area be affected?

A: Both groundwater and surface water levels would be affected by drawdown due to de-watering the mine. Should the project be permitted, groundwater will be drawn down in an area surrounding the ore body as a result of pumping groundwater out of the mine, to enable mining to occur. The drawdown would be most substantial directly over the ore body and would diminish outward. The maximum depth and extent of drawdown would take several years to develop. At that point it would remain relatively constant until the pumps are turned off following the completion of mining. The extent of the drawdown is not definite because at this time, because the numerical modeling which we are using to aid in the prediction is not complete.

Based on the information available now, the maximum horizontal area of the predicted drawdown (the one-foot level is the limit of the predictive accuracy) would be bounded by Swamp Creek on the north, Hemlock Creek and an adjacent wetland on the east, the area extending from Kimberly Lake to Walsh Lake to St. John's Lake to Rolling Stone Lake to the south, and Pickerel Creek to Mole Lake to Rice Lake on the west. This is an area of about 16 square miles (about 10,250 acres).

Using this groundwater drawdown prediction, it is possible to estimate the probable impacts to lake levels and stream flows. Lake level and stream flow change is the result of the interaction of a number of factors. The Department's review of the groundwater flow modeling has not yet been completed, so the Department has not made any forecasts regarding impacts to local lakes and streams. Additional information regarding the lake bed sediments and local hydrogeology has been gathered since 1986 and this information will be used along with more advanced modeling techniques to develop a new forecast.

In the ongoing permitting process, the mining company has made new predictions regarding lake level and stream flow drops if there were no mitigation. These predictions are contained in the following table, and, as mentioned, have not yet been verified by the Department. In considering the significance of these lake level drops, it is important to remember that the mining company would have to supply water in sufficient quantity and of comparable quality in order to prevent significant impacts to public rights in these surface waters. Issues regarding the amount and quality of mitigation water necessary will be addressed in the surface water mitigation plan that is under development by CMC's consultants, with DNR oversight and review.

Table 2. CMC's predicted lake level drawdowns and stream flow reductions

Lake	**Best Engineering Judgement**	**Practical Worst Case**
Little Sand Lake	0.07 feet (0.8 inches)	0.48 feet (5.8 inches)
Duck Lake	0.01 feet (.012 inches)	0.11 feet (1.32 inches)
Deep Hole Lake	0.02 feet (0.24 inches)	0.39 feet (4.7 inches)
Skunk Lake	0.53 feet (6.4 inches)	0.58 feet (7 inches)
Rolling Stone Lake	no impact	no impact
Stream or Spring	**Best Engineering Judgement % Drop, Low Flow Conditions**	**Practical Worst Case % Drop, Low Flow Conditions**
Swamp Cr @ STH 55	7% (minimal impact)	38% (substantial impact)
Hoffman Spring	17% (moderate impact)	22% (substantial impact)
Creek 12-9 (SG-23)	18% (moderate impact)	27% (substantial impact)
Upper Pickerel Cr (SG-19)	25% (substantial impact)	40% (substantial impact)

61.

Q: Groundwater is an important source of oxygen for frozen lakes in the winter. Will drawdown estimates for individual water bodies also consider impacts to lake oxygen levels and the increased risks of winter kill? What will the drainage into Rolling Stone Lake be like?

A: The water level in Rolling Stone Lake is not likely to be affected by the drawdown. (See Response #60.) However, the quantity of the inflow from the influent streams on the north side of the lake, including Pickerel Creek, Creek 11-4, and Creek 12-9, may be reduced; this may reduce the dissolved oxygen entering the lake in the winter. Since we have not yet completed our analysis of the groundwater drawdown, we are not sure what the effects are likely to be. In our Draft Environmental Impact Statement (DEIS) we will be analyzing the effect of reduced inflows into Rolling Stone Lake. If the effects are significant, the mining company will have to propose an acceptable mitigation plan in order to receive approval.

Should the project be permitted, Rolling Stone Lake, the influent streams listed above, and the groundwater near the lake would be monitored to detect changes in the hydrologic system, including dissolved oxygen levels, due to the drawdown. If changes were detected that would impact public rights to Rolling Stone Lake or its incoming streams, a Department-approved mitigation plan would have to be implemented by CMC to remedy the problem. Mitigation options include adding water or dissolved oxygen to the incoming streams or dissolved oxygen to the lake.

62.

Q: Have you been able to predict the *effects* of the drawdown of groundwater which will lower the water levels in adjacent lakes streams and wetlands and their aquatic life?

A: Our groundwater modeling work will assist in the analysis of impacts to lakes and streams from the groundwater drawdown. The modeling has not been completed. Our draft environmental impact statement will contain a full analysis of the groundwater impacts.

Keep in mind that the impacts to lakes and streams from pumping the underground mine cannot significantly adversely impact the public rights in waters of the state. This means that if we predict the drawdown would, without mitigation, affect the public's right to navigation, fishing, or swimming, for example, we could not approve the project unless an acceptable plan would be developed by the company to mitigate those impacts.

63.

Q: Who will pay the property owners a fair value for their land when they no longer have groundwater or when it has become contaminated? What groundwater studies are being done to determine the effect of groundwater drawdown on local drinking water sites? Are there any expected changes in groundwater quality because of the drawdowns? Will the company have to replace wells used for irrigation and farming if they are damaged?

A: A preliminary water well inventory has been conducted to determine for the preparation of the DEIS how many water wells could possibly be affected by the groundwater drawdown. The groundwater drawdown would be caused by continuous pumping from the underground mine to keep it from flooding. Our preliminary determinations are that the maximum extent of the groundwater drawdown would not extend further from the mine site than Swamp and Hemlock Creeks on the north and east, Pickerel Creek on the west, and St. John's Lake to the southeast. The potential impact area will be based upon the Department's review of the groundwater model, and will include an area large enough to extend beyond the area the model predicts as the maximum area of impact (for a "worst case" scenario).

Water wells that we believe would be affected by the project would have to be deepened, re-drilled, or modified (by the company) in some other way to provide adequate quantity and quality of water before de-watering could begin. This would be a condition of the high-capacity well permit. Agricultural and irrigation wells would require the same level of mitigation as household wells. In addition, because the groundwater drawdown would take several years to develop, we would be continuously monitoring progress of the drawdown. Should the drawdown be more extensive than predicted, the company would be required to take action on additional wells, if any, that could be affected.

Property values are not regulated by the state, but can be addressed at a local level. For instance, the local agreement between Crandon Mining Company and the Town of Lincoln has provisions requiring the company to offer to buy property around Ground Hemlock Lake if these properties show a loss of property value due to the functioning of the mine.

Who will pay (for the process, the reclamation, etc.)

64.

Q: Who's paying for these studies? The taxpayers will pay for this. Private property owners will foot the bill!

A: State laws ensure that the taxpayers do not pay for reviews of this type; rather, the company applying for permits must pay. The Crandon Mining Company must, by state law, reimburse the state for the costs to review the permits and prepare the environmental impact statement (EIS), including all consultant costs. EIS and consultant fees, which the company has paid, total more than $610,000 through the first quarter of calendar year 1997. The permit-related fees, which currently total more than $1,000,000, will be paid by the company at the conclusion of the project. These fees must be paid whether the permits are granted or denied.

65.

Q: Why are loopholes allowed in your written material. Example - after 40 years the owner may petition the Department to terminate the owner's obligation to maintain proof of financial responsibility. Remove this part from your paper. Who is going to pay for the toxic waste when in 40 years Exxon may be relieved of financial responsibility? The tailings pond is 844 acres, 26 million tons, 93% tailings material, operative for 35 years, longtime care for 40 years. It will be in existence for 9000 years; therefore, for the remaining 8,925 years, who pays for the clean up of this largest toxic waste dump in Wisconsin history?

A: There are no "loopholes" in our written material. Under current state statutes, the company is required to post bonds or otherwise prove financial capability for long-term care of the reclaimed site. The firm has the right to petition the Department for release of the obligation to maintain proof of financial responsibility 40 years following certification of the completion of reclamation. The Department would deny the petition if monitoring indicates that the site is not environmentally stable. The Department has recently adopted a rule revision that would create a trust fund paid for by the company during its operation of the mine, which would be available for the perpetual care of the site should the company no longer be capable.

Payment for long term care or site maintenance is different than an owner's liability. Under current law, the owner of a mine-waste disposal facility is perpetually liable for the environmental integrity of the site and is held strictly liable for death or injury to persons or property in perpetuity. Strict liability applies without proof of negligence and continues regardless of any change of ownership of the mining site and of any reorganization, merger, consolidation, or liquidation affecting the mining company.

The question incorrectly states that the proposed tailings pond is 844 acres. The lined portion of the proposed facility where the waste would be stored is approximately 220 acres. The questioner also incorrectly states that this would be the largest toxic waste dump in Wisconsin history. The proposed TMA is not a dump, which by definition is an un-engineered dumping site. It is not the largest such facility in the state and under federal and state law these tailings do not meet the criteria of a hazardous or toxic waste. In reality, the design and integrity of the facility are more important than size in determining the degree of risk.

66.

Q: Is Exxon the corporate entity responsible for the mine site reclamation or is it the Crandon Mining Company? Are these two corporations considered to be one in the same? What if CMC declares bankruptcy? Will Exxon & Rio Algom assume liability for reclamation failures and pollution problems that may occur after closure?

A: The operator, Crandon Mining Company, would be responsible for mine site reclamation. Crandon Mining Company was formed in 1993 as an equal partnership between subsidiaries of Exxon Coal and Minerals Co. of Houston, and Rio Algom Ltd. of Toronto. Should CMC go out of business, the parent companies, Exxon and Rio Algom, would become legally responsible for the site (see Response #67).

In addition, the bonds and other financial sureties held by the state are independent of the company, in that they are available to the state regardless of the solvency of the mining company. CMC or their successor company is responsible for long-term care. In the case of the sale of the mining operation, the new owner assumes all responsibility for operation and reclamation of the site and must post replacement bonds with the state prior to release of the original permittee. However, the original operator could still be held liable for costs related to environmental contamination which occurs as a result of their actions. An owner's responsibility for management of a mining waste site never ends.

67.

Q: Have there ever been cases that have been tried successfully where the parent company of a subsidiary has been held liable for environmental damages? I believe they tried and failed at the Summitville Mine in Colorado and now the state is footing the bill. How could the U.S. hold a foreign company liable?

A: The Department is unaware of the particular facts in the Colorado example. In Wisconsin, any corporation not formed in this state is, by statute, a "foreign corporation." As far as the laws of Wisconsin are concerned, General Motors is a foreign corporation. At the same time, a foreign corporation - one incorporated in another state or another country -- must be registered in Wisconsin in order to do business. This registration, along with a presence in the state, serves as the basis for bringing a foreign corporation into a lawsuit and holding it liable under Wisconsin law.

In fact, it is relatively common for a parent company to be held liable for the actions of its subsidiary. Whether a parent company can be held liable depends on the circumstances. Liability is easily enforced if the parent company has exercised some control over the operations of the subsidiary. Under the present state of the law, Exxon Corporation would be held responsible for the actions of the Crandon Mining Company due to the level of control Exxon has exerted over the operations of the Crandon Mining Company. If a parent owns a subsidiary, but exercises no control over its day-to-day operations, it is more difficult to assign liability to the parent company.

Transportation Risks

68.

Q: What highways and railroads will be used to transport Exxon's toxic chemicals such as sodium cyanide? How often are the shipments? Is there a contingency plan during icy road conditions? Has the medical community been canvassed regarding their ability to handle toxic spill medical emergencies?

A: Of the chemical reagents listed in Crandon Mining Company's Environmental Impact Report, only five are regulated by the Wisconsin Department of Transportation and required to carry hazardous warning placards for transport on Wisconsin roadways. The following is a list of these chemical reagents, the estimated quantities and the projected monthly number of truck loads:

Table 3. Chemical Reagents required to carry hazardous warning placards, proposed to be transported to the Crandon Mine

Product	Estimated Monthly Quantity (tons)	Physical State	Approximate Number of Truck Loads per Month	Required DOT Placard on vehicle
Sulfur Dioxide	62	Liquified Gas	3 truck or 0.5 RR cars	Poisonous Gas
Sodium Cyanide	18	Solid briquettes	1	Poison
Thiono-carbamate	4	Liquid	0.18	Flammable
Sulfuric Acid	10	Liquid	0.44	Corrosive
Sodium Hydroxide	0.3	Liquid	0.01	Corrosive

In addition, petroleum products (probably from local suppliers) would be used throughout the construction, operation, reclamation and monitoring operations of the proposed facility. Trucks transporting diesel fuel, gasoline and LP gas would be required to carry the DOT flammable placard.

The first three of the above listed chemical reagents are proposed to be used during the 28-year mill operation. The sulfuric acid and sodium hydroxide are used for water treatment processes which may continue for several years following mine closure. Other products used in the mine, mill, repair shops and laboratories may carry various warning labels but are not included on the list requiring DOT placards during transport.

Crandon Mining Company's preferred method of shipment of these reagents would be by truck. The actual trucking routes would be dependent upon the supplier, which has not been determined at this time. Supplies would likely come from one of the following distribution centers: Chicago, IL; St. Paul, MN; Duluth, MN; Milwaukee, WI, or Green Bay, WI. Due to

economic considerations, the only hazardous reagent that may be shipped by rail is sulfur dioxide.

The Department has not canvassed the medical community on this issue, and has no responsibility to do so. Under Federal law (EPCRA, The Emergency Planning & Community Right to Know Act of 1986), however, companies must report annually the chemicals held on site to both the local fire department and the county emergency government director. Therefore, these teams would have knowledge about the chemicals existing on site in the event of an emergency. Chemicals in transport to the site are not the responsibility of the Crandon Mining Company, but rather of the transport company. The transport company, regulated by the state and federal Departments of Transportation, would presumably have its own contingency plans with regard to spills or icy conditions.